

REMARKS/ARGUMENTS

Reconsideration and withdrawal of the outstanding grounds of rejection are respectfully requested in light of the above amendments and the remarks that follow.

The Examiner has rejected claims 1-28 under 35 U.S.C. § 112, second paragraph, as indefinite, citing language in independent claims 1 and 15 referring to “reaction products between hydrogen gas and surface contaminants or surface oxides”.

By this Amendment, applicants have amended the independent claims 1 and 15 to insert language inadvertently omitted from the original claims. Specifically, independent claim 1, for example, now requires removal of reaction products resulting from a reaction between hydrogen gas and surface contaminants on the article, and claim 15 has been amended similarly. In further answer to the Examiner’s inquiry, the Examiner’s attention is referred to page 6 of the application wherein it is stated that the component 14 to be cleaned may have surface contaminants including oxides and/or surface cracks. Accordingly, for purposes of the claims, surface contaminants and surface oxides are considered equivalents.

In addition, and again for purposes of this invention, the composition of the reaction products is not particularly relevant. According to the specification, the hydrogen gas held at temperature within the vacuum furnace reacts with the surface contaminants and particularly the oxides to form reaction products and, subsequently, those reaction products are removed.

Minor changes have also been made to claims 10 and 19 to refer to “the article” as opposed to “the component” in order to provide the required antecedent basis.

With the above changes, it is respectfully submitted that the Section 112, second paragraph, rejection of claims 1-28 has been overcome.

The Examiner has rejected claims 1, 3, 11, 13, 14, 19, 20 and 25-27 under 35 U.S.C. § 102(b) as anticipated by Nakayama et al. (US 5,505,794).

The Nakayama patent is not all concerned with cleaning the surfaces and surface cracks of a metallic article. Rather, the objective in Nakayama is to heat treat a metallic material by effecting hydrogenation, i.e., causing the metallic material to absorb hydrogen, and then dehydrogenation, i.e., releasing the absorbed hydrogen from the metallic material. The hydrogen is then retrieved for later hydrogenation and dehydrogenation steps. The heat treatment is designed to alter the microstructure of the metallic material so as to adjust the physical properties of that material. In contrast, the present invention as reflected in, for example, claim 1, relates to a cleaning process that involves repetitively cycling hydrogen gas and a vacuum within the furnace by supplying in each cycle a fresh supply of hydrogen gas within the furnace followed by removal of reaction products resulting from a reaction between the hydrogen gas and the surface contaminants on the article, and then removing all residual hydrogen gas. The present invention does not alter the microstructure of the article. Moreover, in Nakayama, there is no disclosure or even remote suggestion that there is any reaction between the hydrogen gas and surface contaminants on the article and thus, no need to be concerned about removing reaction products. Accordingly, Nakayama does not anticipate any of claims 1-3, 11, 13 or 14.

With regard to claims 19, 20 and 25-27, it does not appear that Nakayama heats the article in the vacuum furnace and then, after introducing hydrogen gas into the furnace to obtain a partial pressure within the furnace, raises the temperature of the article to a second higher temperature. Rather, it appears that in Nakayama, the component is heated to a predetermined temperature and then held at that temperature to carry out the hydrogenation step.

Accordingly, none of claims 19, 20 or 25-27 are anticipated by Nakayama.

The Examiner has also rejected claims 4-10 and 21-23 under 35 U.S.C. § 103 as unpatentable over Nakayama for the reasons stated on pages 4 and 5 of the Official Action.

The Examiner acknowledges that Nakayama fails to teach heating the components to a temperature of about 1400°F, or 1800°F or higher. The Examiner further acknowledges that Nakayama fails to teach the specified pressure of the hydrogen gas.

Altering the temperature and pressure values in Nakayama would not have been obvious, since those values are part of a microstructure alternating process. Accordingly, adjusting the temperature and pressures as suggested by the Examiner would likely alter the Nakayama process in a manner nowhere contemplated by the reference.

The Examiner has rejected claims 1, 10, 13-15, 19, 21-25 and 27 under 35 U.S.C. § 103 as unpatentable over Burns et al. (US 6,042,898). According to the Examiner, Burns flows an inert gas into the heating chamber after having evacuated the chamber and then heats the chamber at a predetermined pressure to a temperature of about 1400°F to 1600°F.

Independent claims 1, 15 and 19 require the introduction of hydrogen gas within the furnace followed by removal of reaction products resulting from a reaction between the hydrogen gas and the surface contaminants on the article. In Burns '898, it is disclosed that after flowing an inert gas into the vacuum chamber, an arc is struck between an electrode and the component, with the arc superheating oxides and other contaminants on the blade's surface causing the oxides and contaminants to vaporize. Suitable gases, according to Burns, include helium, argon or mixtures of helium and argon. Nowhere does Burns disclose or suggest the use of hydrogen gas as required by the independent claims of the application. Accordingly, claims 1, 10, 13-15, 19, 21-25 and 27 are patentable over Burns '898.

The Examiner has also rejected claims 1, 4, 11-15 and 23-25 and 27 under 35 U.S.C. § 103 as unpatentable over Burns et al. (2004/0261923).

The Examiner refers to paragraphs 20 and 21 of Burns '1923 as teaching heating an article within a furnace to a temperature of 2000°F and introducing an inert gas, such as hydrogen gas, followed by removal of contaminants by a vacuum pump.

In the paragraphs referenced by the Examiner, Burns is explaining a process for cleaning the furnace chamber during heat treatment of the workpiece, and not the article to be coated. Specifically, Burns discloses that the furnace chamber is first cleaned by heating the furnace to a temperature which is 200°F to 300°F greater than the diffusion heat treatment temperature, typically greater than 2000°F, for a time period of thirty minutes or more. During the heating cycle, the gas is introduced at a low rate which creates movement of contaminants from the center 20 of a workpiece location area towards low pressure areas 26 about the furnace chamber 14 created by one or more vacuum pumps 30 and the exit area 28. There is no mention in Burns '1923 of establishing conditions such that the hydrogen gas reacts with surface contaminants on the article as required by independent claims 1 and 15. By cleaning the furnace chamber, Burns '1923 hopes to avoid contaminants migrating to the coated article (see Col. 2, para. 18). In addition, there is no suggestion in Burns '1923 of the multicycle process required by independent claim 19. Accordingly, claims 1, 4, 11-15, 19, 23-25 and 27 are patentable over Burns '1923.


Applicants gratefully acknowledge that claims 16-18 and 28 contain allowable subject matter. It is respectfully submitted, however, that all of the claims, in the application are not in condition for immediate allowance, and early passage to issue is respectfully requested. In the event, however, any small matters remain outstanding, the Examiner is encouraged to telephone the undersigned so that the prosecution of this application can be expeditiously concluded.

BUDINGER ET AL.
Appl. No. 10/673,317

The Commissioner is hereby authorized to charge any deficiency in the fee(s) filed, or asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Account No. 14-1140.

Respectfully submitted,

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